

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:
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Date of mailing
(day/month/year)

15 SEP 2004

Applicant's or agent's file reference

FOR FURTHER ACTION

See paragraph 2 below

FC0002PCT

International application No.

International filing date (day/month/year)

Priority date (day/month/year)

PCT/US04/04165

10 February 2004 (10.02.2004)

13 February 2003 (13.02.2003)

International Patent Classification (IPC) or both national classification and IPC

IPC(7): B01J 21/18, 23/40, 23/74, 23/00, 23/42, 23/44; H01M 2/00, 2/02, 2/14, 4/86, 4/88, 4/90, 4/96, 8/10 and US Cl.: 502/101, 180, 185, 325, 339; 429/30, 33, 34, 38-44

Applicant

E.I. DU PONT DE NEMOURS AND COMPANY

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US

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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International Application No.

PCT/US04/04165

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material
☐ a sequence listing
☐ table(s) related to the sequence listing
 - b. format of material
☐ in written format
☐ in computer readable form
 - c. time of filing/furnishing
☐ contained in international application as filed.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International Application No.
PCT/US04/04

Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)

Claims Please See Continuation Sheet YES

Claims Please See Continuation Sheet NO

Inventive step (IS)

Claims Please See Continuation Sheet YES

Claims Please See Continuation Sheet NO

Industrial applicability (IA)

Claims Please See Continuation Sheet YES

Claims Please See Continuation Sheet NO

2. Citations and explanations:

Please See Continuation Sheet

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WRITTEN OPINION OF THE
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International Publication No.
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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

V.1. Reasoned Statements:

The opinion as to Novelty was positive (Yes) with respect to claims 1-12, 17-21, 24, 30-34, 37, 45-50, 58-62
The opinion as to Novelty was negative (No) with respect to claims 13-16, 22, 23, 25-29, 35, 36, 38-44, 51-57, 63-66
The opinion as to Inventive Step was positive (Yes) with respect to claims 1-12, 17-21, 24, 30-34, 37, 45-50, 58-62
The opinion as to Inventive Step was negative (NO) with respect to claims 13-16, 22, 23, 25-29, 35, 36, 38-44, 51-57, 63-66
The opinion as to Industrial Applicability was positive (YES) with respect to claims 1-66
The opinion as to Industrial Applicability was negative (NO) with respect to claims NONE

V. 2. Citations and Explanations:

Claims 13-16, 22, 23, 25-29, 35, 36, 38-44, 51-57, and 63-66 lack novelty under PCT Article 33(2) as being anticipated by Auer et al. (U.S. 6,044,410).

Auer et al. teach a platinum/ruthenium alloy catalyst including finely dispersed alloy particles on a powdery, electrically conductive carrier material.

Examples of the carrier material include carbon black. The platinum/ruthenium alloy particles are applied to the carrier material in a concentration of 10 to 50 wt. % based on the total weight of the catalyst. The platinum/ruthenium atomic ratio lies between 1:4 and 4:1. See col. 4, lines 9-17 of Auer et al.

The catalyst is used to prepare various components of fuel cells, such as gas diffusion electrodes (in which the catalyst is processed into an ink using a solution of Nafion and applied as the ink to a carbon paper), proton-conduction polymer membranes, etc. See col. 5, lines 29-50 of Auer et al.

For these reasons, claims 13-16, 22, 23, 25-29, 35, 36, 38-44, 51-57, and 63-66 lack novelty.

Claims 13-16, 25, 26, 28, 29, 38-44, 51-57, and 64-66 lack novelty under PCT Article 33(2) as being anticipated by Adzic et al. (US 6,670,301).

Adzic et al. teach an electrocatalyst provided for use in a fuel cell (having an anode including the electrocatalyst; the anode can preferably have a perfluorinated polymer membrane on its surface). The electrocatalyst comprises a conductive support material, ruthenium nanoparticles and a Group VIII noble metal (preferably platinum). The ruthenium nanoparticles deposited on the support material are preferably suspended in water or a solvent. The Group VIII metal is preferably present in an amount between about 0.1 and 25 wt. % based on the amount of ruthenium nanoparticles.

In terms of the electrocatalyst, there is about 10 to about 40 wt. % platinum and ruthenium, and from about 60 to about 90 wt. % conductive material.

See col. 4, lines 15-40 of Adzic et al.

The electrocatalyst is prepared by depositing ruthenium nanoparticles on the support material, followed by heating in an H₂ atmosphere, cooling, and then contact with a solution containing Group VIII noble metal compound (e.g., H₂PtCl₆). See col. 4, line 41 to col. 5, line 25 of Adzic et al.

**WRITTEN OPINION OF THE
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International Application No.
PCT/US04/00003

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

The electrocatalyst can be employed to prepare fuel cell electrodes (via placing the catalyst on a Nafion membrane), or may be employed to prepare a fuel cell anode (by applying a slurry of the electrocatalyst onto a membrane comprising a perfluorinated polymer, which is then deposited onto a carbon substrate.

For these reasons, claims 13-16, 25, 26, 28, 29, 38-44, 51-57, and 64-66 lack novelty.

Claims 1-12, 17-21, 24, 30-34, 37, 45-50, 58-62 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest the claim limitation regarding the addition of an oxidizing agent.

Claims 1-66 meet the criteria set out in PCT Article 33(4), and thus exhibit industrial applicability because the subject matter claimed can be made or used in industry.